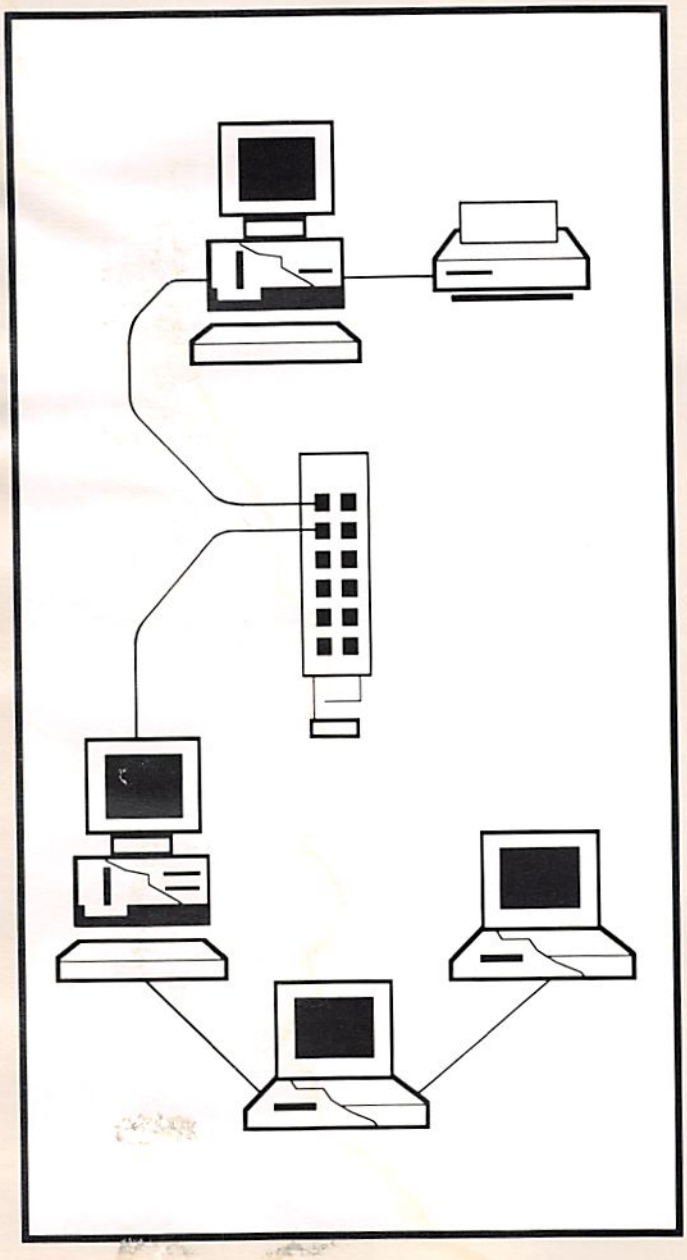
AT&T



STARLAN NETWORK

Design Guide

For more information, consult these AT&T STARLAN NETWORK guides and manuals (ordering codes are in parentheses):

- Introduction (999-809-100 IS)
- Installation and Maintenance Guide (780-100-110 IS)
- PC 6300 Network Access Unit Installation Guide (999-809-102 IS)
- UNIX PC Network Access Unit Installation Guide (999-809-103 IS)
- Network Extension Unit Installation Guide (999-809-106 IS)
- Technical Reference Manual (999-300-208 IS)
- Application Programmer's Reference Manual (999-802-215 IS)

These documents may be ordered from:
AT&T Customer Information Center
Commercial Sales
P. O. 19901
Indianapolis, IN 46219
1-800-432-6600

Additional documents are packaged with the network software.

Prepared by Technical Publications
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Middletown, NJ 07748

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WARNING

The equipment described here generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. The equipment has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference.

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1 INTRODUCTION

The *STARLAN NETWORK Design Guide* describes the AT&T STARLAN NETWORK hardware, software, and configurations, and guides you in designing a network.

Chapter 1 introduces the STARLAN NETWORK by describing its present capabilities and forthcoming enhancements.

Chapter 2, "Hardware and Software," explains the functions of each STARLAN NETWORK component and provides illustrations, technical specifications, and packaging details.

Chapter 3, "Configurations," describes the STARLAN NETWORK's three basic configurations. This chapter provides guidelines for choosing configurations, and states the cord lengths and numbers of personal computers each configuration supports.

Chapter 4, "Designing a STARLAN NETWORK," provides step-by-step guidelines for designing your network and determining the components, including wiring hardware, your network requires.

This document assumes that you are familiar with personal computers and their terminology, and have some knowledge of phone wiring environments. For a non-technical description of the STARLAN NETWORK, emphasizing smaller configurations that use modular phone cord rather than building phone wiring as the network medium, see the *STARLAN NETWORK Introduction*. For detailed installation procedures, see the *STARLAN NETWORK Installation and Maintenance Guide.*

Capabilities of the STARLAN NETWORK

The AT&T STARLAN NETWORK is an inexpensive, easy-to-install personal computer network that you can expand as your computing needs grow.

The AT&T STARLAN NETWORK

- Enables the AT&T Personal Computer 6300 and compatible computers and the AT&T PC 6300 PLUS, all using the MS-DOS® 3.1 or later operating system, to share files and printers through a server PC;
- Enables the AT&T UNIX™ PC Models 7300 and 3B1 using the UNIX PC System Software Version 3.0 or later to share files and printers with each other directly;
- Enables MS-DOS-based and UNIX-based PCs to share a network;
- Supports electronic mail, asynchronous terminal emulation, and popular application programs;
- Supports network application programs designed for MS-DOS 3.1, including IBM® PC Network application programs, enabling more than one user to work with the same file at once;
- Is compatible with the IEEE 802.3 draft standard for local area networks;
- Transfers data at 1 megabit per second;
- Uses modular phone cords and two unshielded twisted pairs in AT&T building wiring environments as the networking media, so that personal computers in many offices can be linked together without installing new cable.

The MS-DOS 3.1 computers that the STARLAN NETWORK links are

- AT&T PC 6300
- AT&T PC 6300 PLUS running the MS-DOS operating system
- IBM® PC, PC-XT™, PC-AT™, and other PC 6300 compatible computers.

The UNIX PC System Software Version 3.0 computers are

- AT&T UNIX PC Model 7300
- AT&T UNIX PC Model 3B1

The STARLAN NETWORK supports a typical department equipped with 50 to 100 personal computers.

The simplest and least expensive STARLAN NETWORK configuration supports up to 10 personal computers at a maximum distance of 400 feet (122 meters) in cord length from end to end. The largest configuration supports as many as 200 computers using light applications such as electronic mail and printer sharing, and each computer can be a maximum distance of 800 feet (244 meters) from a hub.

Enhancements

Enhancements for the AT&T STARLAN NETWORK provide

- An AT&T DOS Server Program for the UNIX PC Models 7300 and 3B1;
- A 3B2 Network Access Unit, Network Program, and DOS Server Program, for the 3B2 line of computers;
- A connection to AT&T Information Systems Network;
- A Network Interface Unit with two built-in ports for connections to RS-232C devices such as host computers, terminals, and printers.

These enhancements will be available in 1986.

2 HARDWARE AND SOFTWARE

AT&T STARLAN NETWORK consists of the following network components:

- Network Access Units
- Network Extension Units
- Modular cords and AT&T building phone wiring.

The network uses the following network software:

- Network Program for the AT&T PC 6300 and compatible computers and the AT&T PC 6300 PLUS;
- Network Program for the AT&T UNIX PC Models 7300 and 3B1.

Each is described in detail in this chapter.

Network Access Units

A Network Access Unit (NAU) is a plug-in expansion card. Installed in each personal computer on the network, it enables the PC to send and receive data. The NAU is the basic building block of the STARLAN NETWORK and, together with a modular cord, is the only hardware component a small configuration requires.

Each NAU has three jacks: an IN, OUT, and PHONE jack. These jacks accept standard modular cords, and are provided to meet the needs of all possible configurations. You connect the network by plugging a modular cord between the IN jack of one unit and the OUT jack of another.

The PHONE jack is a convenience jack, used in configurations connected through building phone wiring. It allows a single-line analog phone and a personal computer to be connected to the wiring system at a single outlet.

Two kinds of NAUs are available for the STARLAN NETWORK:

- AT&T PC 6300 NAU for use with the AT&T PC 6300, the AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT, and other PC 6300 compatible computers.

  This NAU has user-adjustable option settings, making it compatible with other expansion cards including the AT&T Communications Manager. The NAU can be connected to a Communications Manager jack with a short modular cord.
- AT&T UNIX PC NAU for use with the UNIX PC Models 7300 and 3B1.

  This NAU is compatible with the built-in communications capabilities of the AT&T UNIX PC Models 7300 and 3B1, and can be connected to a UNIX PC LINE jack with a short modular cord.

Each NAU is packaged with a 10-foot DW8A-DE modular cord, an installation guide, and a diagnostic disk. The AT&T PC 6300 NAU kit also includes a card support bracket for installing the NAU in an IBM PC or PC-XT.

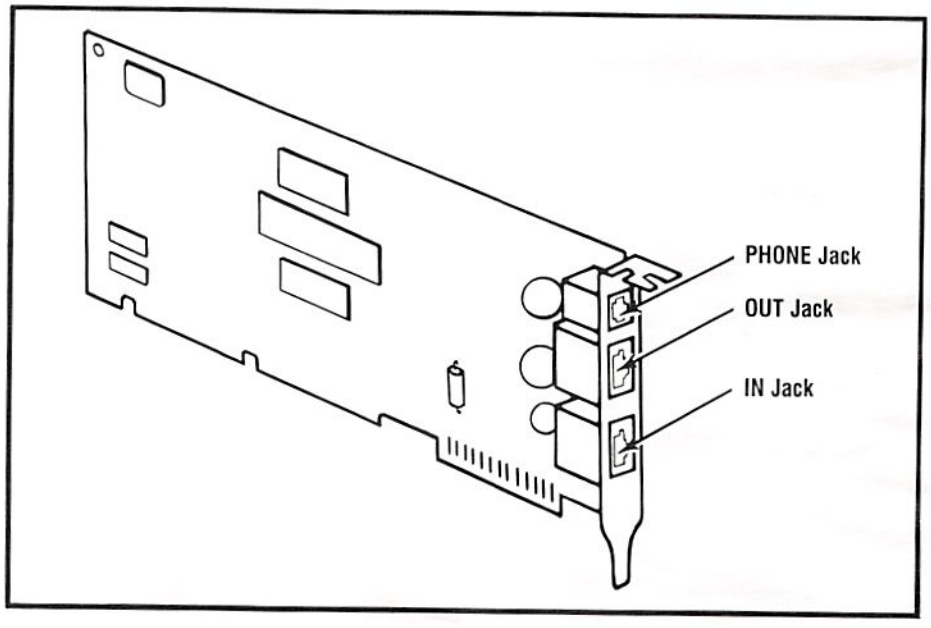
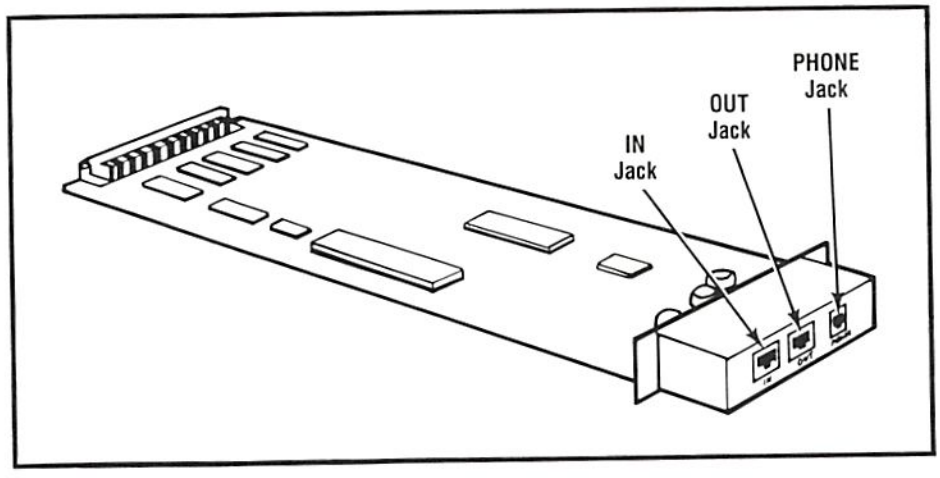


Figure 1. The Network Access Unit for the AT&T PC 6300 and compatible computers.

Figure 2. The Network Access Unit for the AT&T UNIX PCs.



	AT&T PC 6300 and Compatibles Network Access Unit	AT&T UNIX PC Network Access Unit
DIMENSIONS	Occupies a single full-sized expansion slot	Occupies a single expansion slot
POWER REQUIREMENTS	+5.0 Vdc, 1.0A -5.0 Vdc, 0.03A	+5.0 Vdc, 1.0A -5.0 Vdc, 0.05A
STORAGE ENVIRONMENT	-40 to 60 degrees Centigrade -40 to 140 degrees Fahrenheit 8% to 95% humidity, non-condensing 0 to 30,000 feet altitude 0 to 9 kilometers altitude	-40 to 60 degrees Centigrade -40 to 140 degrees Fahrenheit 5% to 95% humidity, non-condensing 0 to 30,000 feet altitude 0 to 9 kilometers altitude
OPERATING ENVIRONMENT	0 to 40 degrees Centigrade 32 to 104 degrees Fahrenheit 8% to 80% humidity, non-condensing 0 to 10,000 feet altitude 0 to 3 kilometers altitude	0 to 40 degrees Centigrade 32 to 104 degrees Fahrenheit 20% to 80% humidity, non-condensing 0 to 10,000 feet altitude 0 to 3 kilometers altitude
FCC COMPLIANCE	Complies with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules.	Complies with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules.
OPTIONS	**Interrupt request:** 2, 3, 4, 7 **I/O Address:** 360 to 367, 368 to 36F **RAM Address:** 80000 to E0000	

Network Extension Unit

The Network Extension Unit (NEU), at the hub of larger STARLAN NETWORK configurations, connects personal computers in a way that makes it easy to expand the network with mimimal disruption. Only 12 inches (30 centimeters) high by 2.5 inches (6 centimeters) wide by 6 inches (15 centimeters) deep, the NEU mounts on the wall in an office or in a phone wiring closet, depending on the configuration.

The NEU receives signals from each PC through its 11 modular IN jacks, amplifies the signals, and sends them back through the IN jacks to the PCs. If two or more PCs transmit data at the same time, the NEU sends a collision presence signal, which alerts them to stop transmitting, wait, then retransmit their data.

A PC or group of linked PCs is added to the network simply by connecting a modular cord between a Network Access Unit OUT jack and an NEU IN jack. Adding a PC in this way does not disrupt communications between the other computers on the network.

In addition to the 11 IN jacks, the NEU has an OUT jack, used for expanding a network by linking NEUs. The OUT jack of each secondary NEU is connected with a modular cord no longer than 2.5 feet (76 centimeters) to any IN jack of the original, Master NEU.

Each NEU is packaged with a mounting frame, two screws and wall anchors, labels for identifying connections, a label holder, a power unit, and an installation guide.

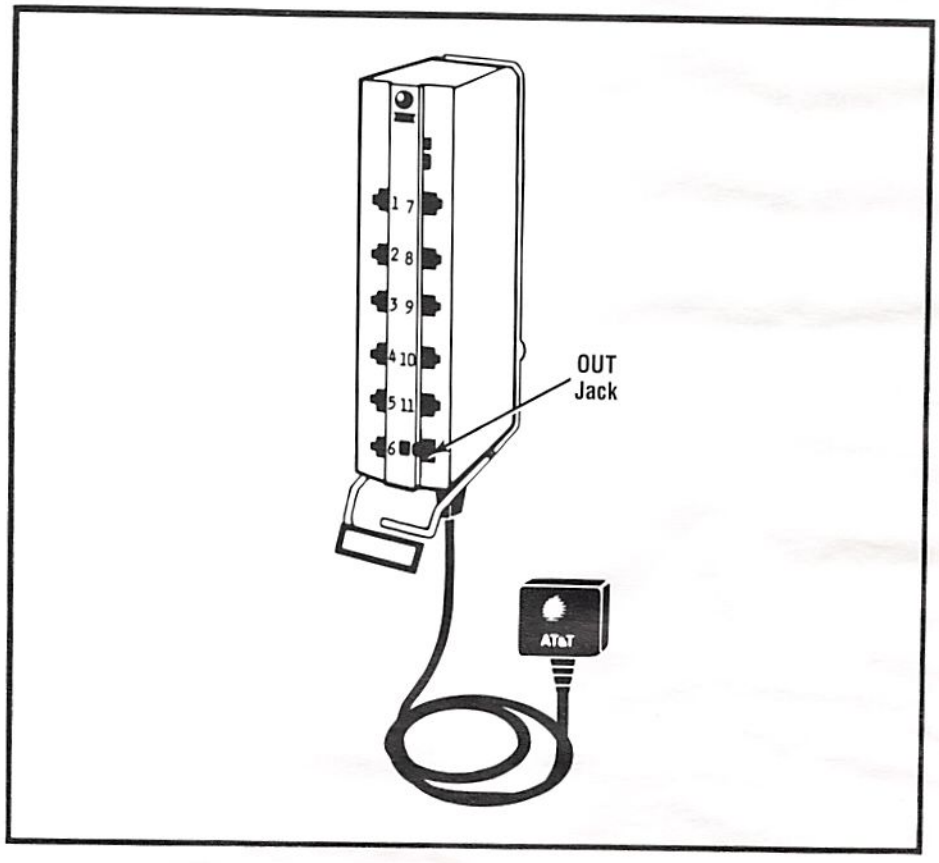


Figure 3. The Network Extension Unit with wire mounting frame and power unit.

	Network Extension Unit
MODULAR JACK PORTS	11 IN jacks for connecting devices 1 OUT jack for connecting to a Master NEU
DIMENSIONS	12 in. high x 2.5 in. wide x 6 in. deep (30 cm. x 6 cm. x 15 cm.) Allow 20 sq. in. (129 sq. cm), to provide room for modular cords
POWER REQUIREMENTS	105 to 130 VAC, 60 Hz, 8 watts
POWER UNIT U.L. LISTING	Plug-in Class 2
CSA CERTIFIED	Yes
STORAGE ENVIRONMENT	-40 to 60 degrees Centigrade -40 to 140 degrees Fahrenheit 5% to 95% humidity, non-condensing 0 to 30,000 feet altitude 0 to 9 kilometers altitude
OPERATING ENVIRONMENT	0 to 50 degrees Centigrade 32 to 122 degrees Fahrenheit 5% to 95% humidity, non-condensing 0 to 10,000 feet altitude 0 to 3 kilometers altitude
FCC COMPLIANCE	Complies with the limits for Class A computing device pursuant to Subpart J of Part 15 of FCC Rules.

Modular Cords and Building Phone Wiring

The DW8A-DE modular cord that comes packaged with each Network Access Unit (NAU) is similar to the modular cord that connects an office phone to the wall jack. It contains four sets of twisted-pair wire. Modular cord is an efficient medium for linking a network because it is

- Inexpensive
- Easy to install
- Available in a variety of lengths.

A building's phone wiring is an efficient medium for linking large networks because this wiring is already installed in most buildings, and is relatively inexpensive to install in new buildings or for configurations that require additional jacks and wiring.

The STARLAN NETWORK can be installed in these AT&T building wiring environments:

- Premises Distribution System (PDS), also called 110-Type environment
- 66-Type environment
- 1A-Key System environment.

Wiring environments from manufacturers other than AT&T may have different electrical characteristics, so contact the manufacturer to determine whether its wiring environment supports the AT&T STARLAN NETWORK.

Software

The AT&T STARLAN NETWORK offers these software packages:

AT&T PC 6300 Network Program

This program enables PC 6300s and compatible computers and PC 6300 PLUSes running the MS-DOS 3.1 or later operating system to share files and printers at servers, and to simultaneously function as workstations and servers for compatible PCs.

A **server** is a PC 6300 or compatible computer or a PC 6300 PLUS that provides files and printers for use by other computers running the MS-DOS operating system. Non-server PCs on the network are called **workstations,** simply to distinguish them from servers.

A workstation can use multiple servers simultaneously—for example, to access a file on a server hard disk while sending a print job to another server. Commands are accessed through a full-screen menu-style interface or, if the user prefers, through a standard command line.

This program supports popular MS-DOS applications, including Lotus 1-2-3®, Multiplan®, and dBase III®, and IBM PC Network applications. The program also supports an AT&T electronic mail package called "The Network Courier," and supports asynchronous terminal emulation. All of these applications are packaged separately. The Network Program requires a minimum of 256 Kbyte RAM. A PC will need more RAM to support some applications or to function as a server.

File sharing: Enables users to read, write, and create files located at servers as if the files were in the disk drives of the user's workstation. Users can access a number of different files simultaneously. Files can be secured with passwords and access rights.

Printer sharing: Enables users to send print jobs to printers attached to a server; print multiple copies and screen dumps; and cancel, reorder, and move print jobs. These print jobs can include graphics when sent to a graphics printer.

Server functions: Enables a personal computer to store files for and share printers with MS-DOS workstations. A server requires a minimum of 512 Kbyte RAM and a 10-Mbyte hard disk.

It controls up to three attached printers (two parallel and one serial), each of which can accept jobs simultaneously from two or more workstations. Printers supported by the STARLAN NETWORK include AT&T dot matrix printers Models 473 and 475; AT&T daisy wheel printers Models 455, 457, and 458; AT&T laser printer Model 490; and the Hewlett-Packard LaserJet Printer.

Any MS-DOS workstation equipped with sufficient memory and a hard disk can be put to use as a server, when required by network expansion. There's no limit to the maximum number of servers in a network. For guidelines on estimating the number of servers appropriate for your network, see the "Design Guidelines" section of Chapter 4, "Designing a STARLAN NETWORK."

AT&T UNIX PC Network Program

This program enables AT&T UNIX PCs, running UNIX PC System Software Version 3.0 or later, to transfer files among and printers with each other, and to support multiple connections simultaneously. The program supports electronic mail and asynchronous terminal emulation. Commands are accessed through the UNIX PC User Agent full-screen interface.

File transfer: Enables users to copy, receive, and send files between their UNIX PCs by using standard UNIX uucp file transfer commands. Files can be secured with passwords and access rights.

Printer sharing: Enables users to share printers attached to other UNIX PCs.

Remote login: Enables users of other PCs running asynchronous terminal emulation to log into a UNIX PC. Applications are run through the UNIX PC User Agent. Access can be secured with passwords.

3 CONFIGURATIONS

The AT&T STARLAN NETWORK can be configured for any office layout, and rearranged and expanded at low cost.

From smallest to largest, the STARLAN NETWORK configurations described in this section are

- Daisy Chain
- Room Star
- Closet Star.

Daisy Chain

In a Daisy Chain configuration, a Network Access Unit (NAU) is installed in each workstation and server. The IN jack of one NAU is linked to the OUT jack of another with a modular cord. The OUT jack of the first and the IN jack of the last NAUs are left empty.

Because a Daisy Chain requires minimal network hardware, it's the least expensive STARLAN NETWORK configuration. And because installation is simple, users can install a Daisy Chain themselves. Active Daisy Chain workstations can exchange data even when other workstations in the chain are turned off. However, adding or removing a workstation or server disrupts communications until all NAUs in the Daisy Chain are connected.

A Daisy Chain configuration can support up to 10 workstations and servers linked by cords totaling a maximum of 400 feet (122 meters). If users are in adjoining rooms, and if building codes permit, the modular cords can be routed through drop ceilings (plenum ceilings require plenum cords) or through holes drilled in the walls.

Personal computers in a Daisy Chain cannot be connected through a building's phone wiring.

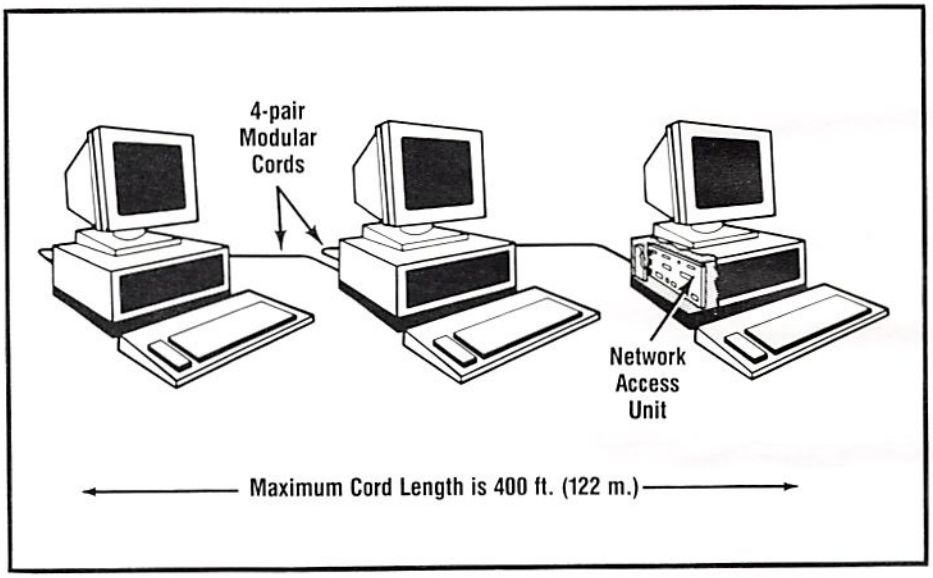


Figure 4. A Daisy Chain of three AT&T PC 6300s.

Room Star

In a Room Star configuration, workstations and servers in a single room are connected to the Network Extension Unit (NEU). The NEU mounts wherever it's most convenient for routing modular cords, and near an electric outlet to power the NEU.

Adding a workstation or server is a simple matter of installing a Network Access Unit (NAU), and plugging one end of a modular cord into the OUT jack of the NAU and the other end into an IN jack on the NEU. To remove the workstation or server, unplug the cord. A Room Star, then, can be expanded and rearranged without disrupting the network.

When a Room Star uses multiple NEUs, designate one the Master NEU. The OUT jack of each secondary NEU is then connected by a D8W modular cord to an IN jack of the Master NEU. For efficient network operation, no more than four NEUs should be linked in a Room Star. The maximum length of the cords connecting a workstation or server to an NEU is 800 feet (244 meters).

A Room Star configuration is appropriate for workstations and servers located in a single large office space, and provides easier rearrangement and expansion than a Daisy Chain. The configuration supports a typical department equipped with 50 to 100 personal computers, approximately 25% of which use the network at any given time. A Room Star can support as many as 200 computers using light applications such as electronic mail and printer sharing.

As many as 10 workstations and servers can be linked in a Daisy Chain to each IN jack on an NEU. The maximum cord length of such a Daisy Chain varies from 400 feet (122 meters) to 800 feet (244 meters), depending on the number of personal computers in the Daisy Chain. For more information, see the "Design Guidelines" section of Chapter 4, "Designing a STARLAN NETWORK."

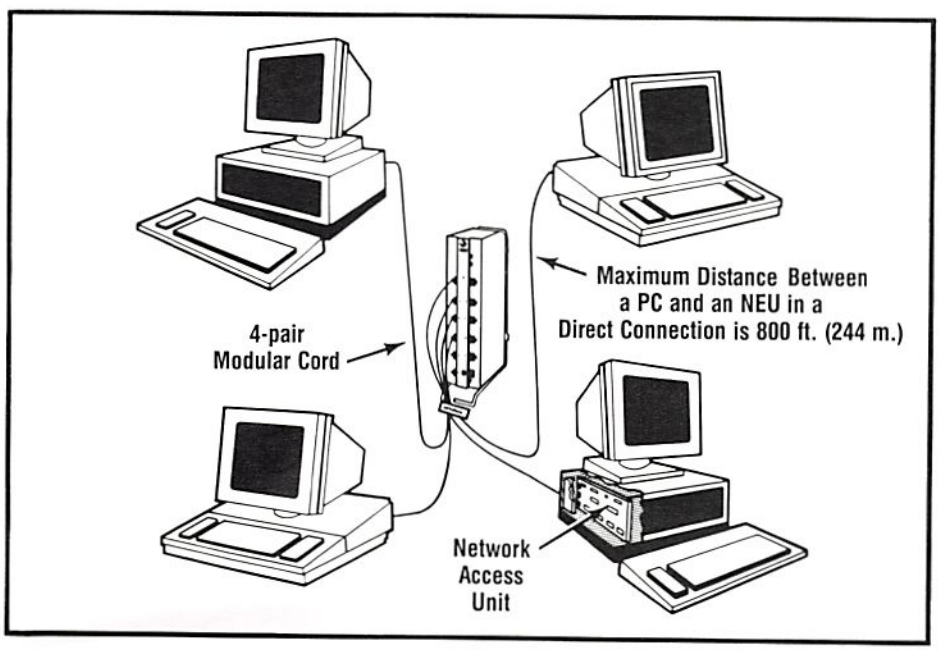


Figure 5. A Room Star of two AT&T PC 6300s and two AT&T UNIX PCs.

Closet Star

A Closet Star connects workstations and servers through the unused pairs in a building's phone wiring. A single-line analog phone can share the wall jack with a workstation or server. The result is offices uncluttered by extra cords and cables. Each workstation or server requires two pairs of wire unused by phones or other devices.

The Network Access Unit (NAU) installed in each workstation or server is connected with a modular cord to an office phone outlet. At the outlet, the workstation or server is wired through the unused pairs to a Network Extension Unit (NEU) mounted in the wiring closet.

A single-line analog phone displaced from the phone outlet can access the phone pairs through the PHONE jack on the NAU. A digital phone or a hybrid analog-and-digital phone displaced from the phone outlet requires an additional outlet. When a Daisy Chain is connected to a Closet Star, only the PHONE jack on the first personal computer in the Chain, that is, the one plugged into the phone outlet, can be used.

The Closet Star can use up to 12 NEUs located in the same closet. The group of NEUs is called the network hub.

Installing a Closet Star requires first identifying the building's wiring environment, then selecting or installing at each office wall outlet the adapter or connecting block that accesses the two unused pairs. Next, the modular cords that connect the NAUs to the wall outlets must be selected. Finally, the appropriate connections must be made in the wiring closet. Accordingly, a Closet Star must be configured and installed by an AT&T representative or other knowledgeable professional.

A Closet Star configuration is appropriate when users are located in non-adjoining rooms. It also provides greater security, because the wiring closets can be locked to prevent unauthorized people from unplugging cords from the NEUs.

This configuration supports a typical department equipped with 50 to 100 personal computers, approximately 25% of which use the network at any given time. A Closet Star can support as many as 200 computers using light applications such as electronic mail and printer sharing.

As many as 10 workstations and servers can be linked in a Daisy Chain to each IN jack on an NEU. The maximum cord length of such a Daisy Chain varies from 400 feet (122 meters) to 800 feet (244 meters), depending on the number of personal computers in the Daisy Chain. For more information, see the "Design Guidelines" section of Chapter 4, "Designing a STARLAN NETWORK."

The maximum total length of the cords connecting a single workstation or server to the NEU in the hub is 800 feet (244 meters).

A Closet Star can be installed in the AT&T Premises Distribution System, the AT&T 66-Type environment, and the AT&T 1A-Key System environment.

Wiring environments from manufacturers other than AT&T may have different electrical characteristics, so contact the manufacturer to determine whether its wiring environment supports the AT&T STARLAN NETWORK.

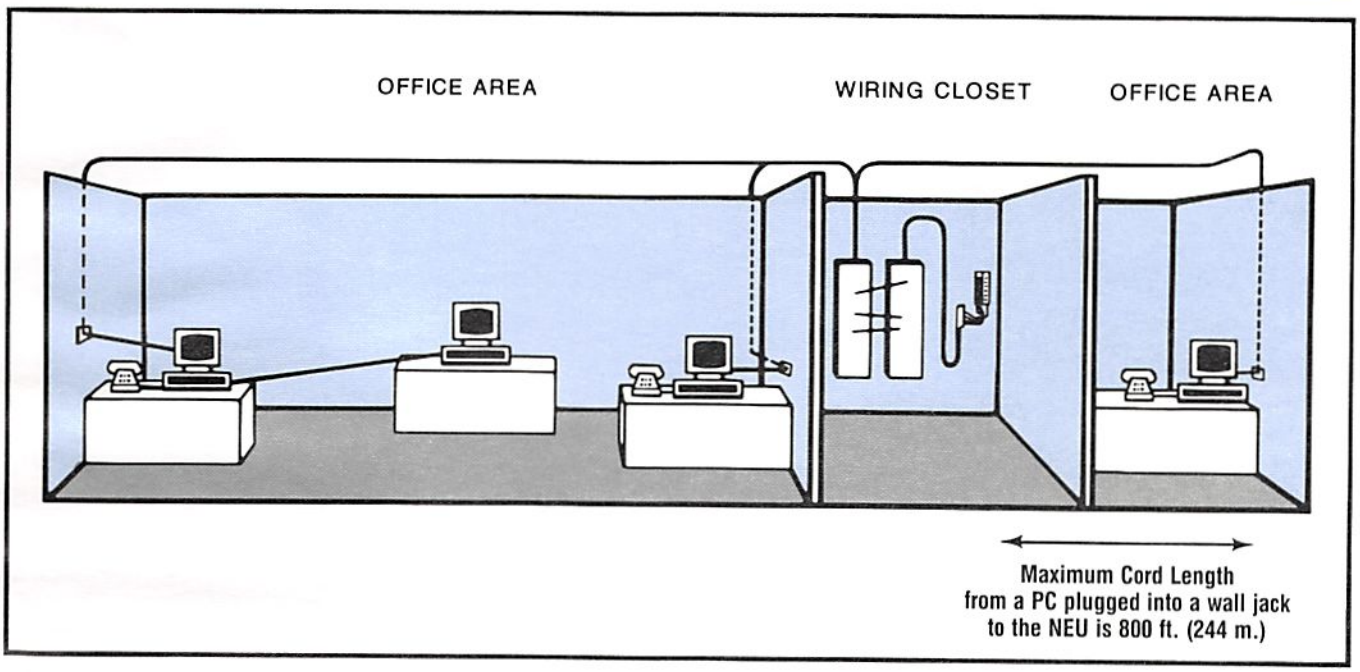


Figure 6. A Closet Star. The office on the left has a two-PC Daisy Chain plugged into the wall jack, with a phone plugged into the NAU PHONE jack of the PC nearest the wall. The other PC, like the PC in the office on the right, has a phone plugged into its NAU and is in turn plugged into a wall jack. All PCs are connected through the building phone wiring to the NEU in the wiring closet.

4 DESIGNING A STARLAN NETWORK

Once you have selected a STARLAN NETWORK configuration, you should

1. Determine how much RAM your personal computers require to run the Network Program and application software
2. Estimate the number of servers your network requires
3. Determine the actual layout of your configuration
4. Determine the components your network requires.

The "Design Guidelines" section of this chapter guides you through these procedures.

Use "Design Guidelines" first. It provides a table showing the memory, operating system, software, and Network Access Unit required by each workstation or server PC. This section helps you estimate how many servers your network requires, and which configuration to use.

The remaining sections of this chapter guide you through selecting parts for each configuration. They assume that you have used "Design Guidelines."

The final step in designing your network is to assign a network administrator. The administrator is responsible for installation, maintenance, and troubleshooting. Depending on the size of your network, this may be a part-time or full-time responsibility.

Design Guidelines

Minimum Requirements

This table shows the minimum requirements for a personal computer operating in the STARLAN NETWORK.

	Minimum RAM & Disk Space	Operating System	Network Program	NAU
AT&T PC 6300 AND COMPATIBLE COMPUTERS				
Workstation	256 Kbyte RAM Floppy disk	MS-DOS 3.1	AT&T PC 6300 Network Program	AT&T PC 6300 Network Access Unit
Server	512 Kbyte RAM 10-Mbyte hard disk			
Concurrent Workstation and Server	640 Kbyte RAM 10-Mbyte hard disk			
AT&T PC 6300 PLUS				
DOS Workstation	512 Kbyte RAM Floppy disk	MS-DOS 3.1	AT&T PC 6300 Network Program	AT&T PC 6300 Network Program Unit
DOS Server	512 Kbyte RAM 20-Mbyte hard disk			
Concurrent Workstation and Server	640 Kbyte RAM 20-Mbyte hard disk			
AT&T UNIX PC MODELS 7300 & 3B1	1 Mybyte RAM 20-Mbyte hard disk for Model 7300 40-Mbyte hard disk for Model 3B1	AT&T UNIX PC System Software Version 3.0	AT&T UNIX PC Network Program	AT&T UNIX PC Network Access Unit

Workstation Guidelines for AT&T PC 6300, PC 6300 PLUS, and Compatible Computers

An AT&T PC 6300, PC 6300 PLUS, or compatible computer may need additional RAM to run an application along with the Network Program.

- To estimate the total RAM needed, add 96 Kbytes to the amount of RAM recommended for the application. Use this amount of RAM or 256 Kbytes, whichever is larger.
- Workstations with hard disks are appropriate for users needing a large amount of unshared disk space.

Server Guidelines for AT&T PC 6300 and PC 6300 PLUS

Here are guidelines for estimating the number of servers and the amount of server hard disk space required for your network's file and printer sharing needs.

Special consideration: For file protection, a server should be equipped with a compatible disk expansion and tape backup unit, such as the Mountain® 6300 Combo.

File Sharing

1. Estimate the hard disk space required for each user's
   - spreadsheets, documents, data bases, and other shared network files;
   - private files.

   Users whose workstations lack a hard disk might store all of their files on a server.
   Rule of thumb: A typical workstation might require 5 Mbytes of hard disk space.
2. Decide how much hard disk space to reserve for adding new users.
3. Add these estimates, to produce an estimate of the total server hard disk space your network requires.
4. Estimate how frequently users will access the server.
   - A user can connect to two or more servers simultaneously, but is likely to use only one at a time.

   Rule of thumb: A PC 6300 can serve four to eight workstations. A PC 6300 PLUS can serve six to 12 workstations.

Your network should have enough servers to provide the total server hard disk space and to handle the frequency of workstation access, as well as provide for your estimated network expansion.

Printer Sharing

To estimate how many printers will handle your network printing needs, and how many printers each server should manage, consider the following issues:

- The total number of documents users will print each day.
- The average document length.
- The printing speed of each network printer. The slower the printer, the longer users must wait for their print jobs.
- The distance users must walk to pick up their printing.
- Special printing needs, such as laser-quality or letter-quality printing.

Rule of thumb: Every 10 users should have one printer server.

Special consideration: To prevent printer noise from interfering with worker productivity, place noisy, frequently-used printers out of earshot of network users.

Concurrent Server Guidelines for AT&T PC 6300 and PC 6300 PLUS

The following guidelines are for personal computers functioning concurrently as workstations and servers.

- A concurrent server PC is appropriate when network workstations make light use of the server functions, and when the PC is used infrequently as a workstation.
- The RAM requirements for the server and application must not exceed the PC's available RAM.
- Do not use a workstation application that requires resetting the PC. Resetting the PC will interrupt the server functions and disrupt service.

AT&T UNIX PC Guidelines

These guidelines are for estimating the number of users, remote login sessions, and printers for UNIX PCs.

- A UNIX PC Model 7300 can support up to three simultaneous users; a Model 3B1 can support up to five.
- The number of remote login sessions is not changed by using the STARLAN NETWORK.
- The printer sharing considerations for the PC 6300 and PC 6300 PLUS also apply to the UNIX PC.

Maximum Active Sessions

The STARLAN NETWORK supports a typical department with 50 to 100 personal computers, approximately 25% of which use the network at any given time. Heavier use may require a lower limit. The network can support as many as 200 computers using light applications such as electronic mail and printer sharing.

Daisy Chain Design Guidelines

- The longest distance between personal computers on a Daisy Chain is 400 feet (122 meters).
- Use the shortest possible cord between personal computers, consistent with a convenient layout in the workplace. This provides you with the maximum distance available for adding additional computers at the end of the Daisy Chain, or for linking the Daisy Chain to a Network Extension Unit.
- To allow for expansion, keep the number of personal computers in a Daisy Chain less than the maximum of 10 personal computers.
- For the most efficient network performance, distribute heavy users and servers uniformly among Daisy Chains. For example, instead of having a Daisy Chain with four heavy users and another with four light users, place two heavy users on each Daisy Chain.
- Add new computers to the ends of lightly-loaded Daisy Chains.
- Keep each Daisy Chain within one room. Do *not* connect a Daisy Chain through building phone wiring.

  Reminder: Adding or removing a personal computer from a Daisy Chain disrupts the Daisy Chain.

Room and Closet Star Design Guidelines

- The maximum distance from a personal computer to the Network Extension Unit (NEU) is 800 feet (244 meters).
- The heaviest user or server should be connected directly to the NEU, and should not be part of a Daisy Chain.
- For efficient network performance, do not load a single NEU with many large Daisy Chains. Instead, connect the Daisy Chains to a number of NEUs, and connect the NEUs in turn to a Master NEU.
- The maximum length of cord connecting the last personal computer in a Daisy Chain to the NEU depends on the number of computers in the Daisy Chain. Use the following table to determine this distance.

MAXIMUM CORD LENGTH FOR A DAISY CHAIN CONNECTED TO AN NEU		
Number of Personal Computers in the Daisy Chain	**Maximum Cord Length for 1 NEU**	**Maximum Cord Length for 2 or more NEUs**
1	800 ft. (244 m.)	800 ft. (244 m.)
2	800 ft. (244 m.)	800 ft. (244 m.)
3	800 ft. (244 m.)	800 ft. (244 m.)
4	800 ft. (244 m.)	800 ft. (244 m.)
5	800 ft. (244 m.)	725 ft. (220 m.)
6	725 ft. (221 m.)	625 ft. (191 m.)
7	625 ft. (191 m.)	550 ft. (168 m.)
8	550 ft. (168 m.)	450 ft. (137 m.)
9	450 ft. (137 m.)	400 ft. (122 m.)
10	400 ft. (122 m.)	400 ft. (122 m.)

- You will be able to add a new personal computer or Daisy Chain to a Star either by
  - — plugging the PC or Daisy Chain into a Daisy Chain
  - — plugging the PC or Daisy Chain into an NEU.

  Use the table below to determine the number of NEUs your network needs. The number of spare IN jacks is a recommendation. Be sure to leave enough spares to provide for the rearrangement or growth you anticipate for your network.

Number of Direct Connections from PCs and Daisy Chains	Number of NEUs	Recommended Number of Spare IN Jacks
1-10	1	1
11-19	2	2
20-29	3	2
30-39	4	2
40-49	5	2
50-58	6	3
59-68	7	3
69-77	8	4
78-87	9	4
88-97	10	4
98-107	11	4
108-117	12	4

Network Maps

To make your design task easier, prepare a set of network maps showing the office locations of each workstation, server, and Network Extension Unit (NEU), and the required network connections. Later, these maps will help you install, administer, and maintain your network.

Here are two sample maps you can use as models for the maps of your own installation. Be sure to record the indicated information for each workstation or server. If you have a Daisy Chain connected to an NEU, prepare a separate map for the Daisy Chain and refer to it with a label in the appropriate block on the NEU map.

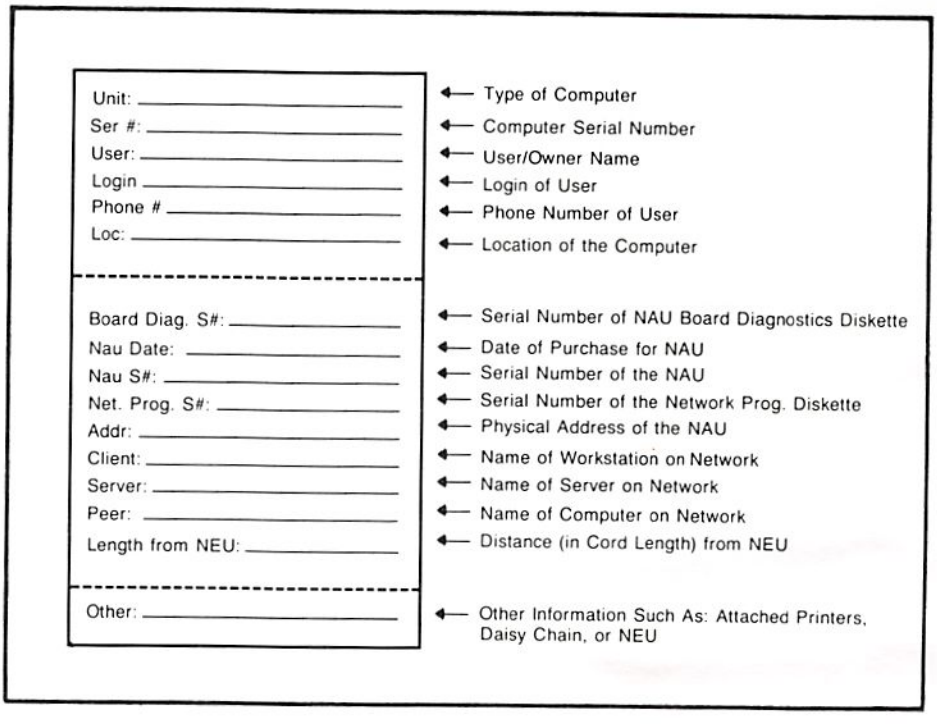

Unit: ← Type of Computer
Ser #: ← Computer Serial Number
User: ← User/Owner Name
Login ← Login of User
Phone # ← Phone Number of User
Loc: ← Location of the Computer
Board Diag. S#: ← Serial Number of NAU Board Diagnostics Diskette
Nau Date: ← Date of Purchase for NAU
Nau S#: ← Serial Number of the NAU
Net. Prog. S#: ← Serial Number of the Network Prog. Diskette
Addr: ← Physical Address of the NAU
Client: ← Name of Workstation on Network
Server: ← Name of Server on Network
Peer: ← Name of Computer on Network
Length from NEU: ← Distance (in Cord Length) from NEU
Other: ← Other Information Such As: Attached Printers, Daisy Chain, or NEU

Figure 7a. Network Map Record Form. Record this information for each workstation or server.

Figure 7b. Daisy Chain Map. Make a map like this to record how the PCs are connected in a Daisy Chain.

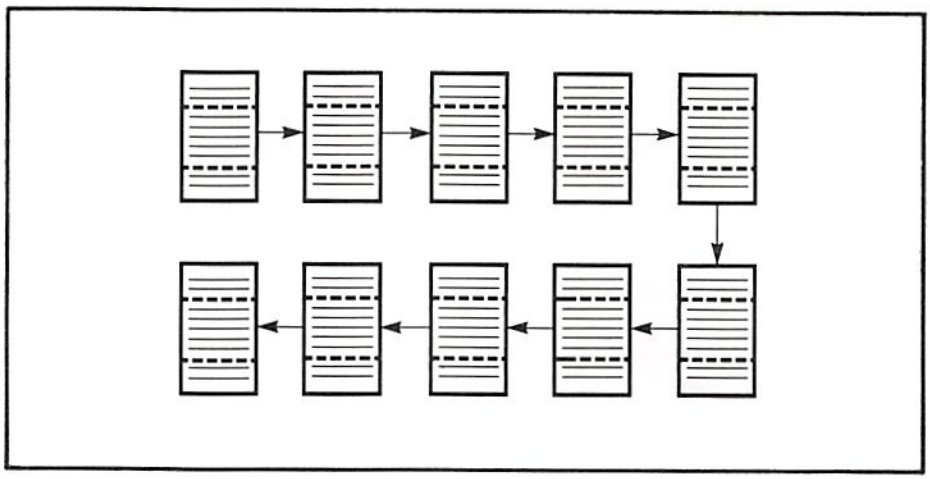
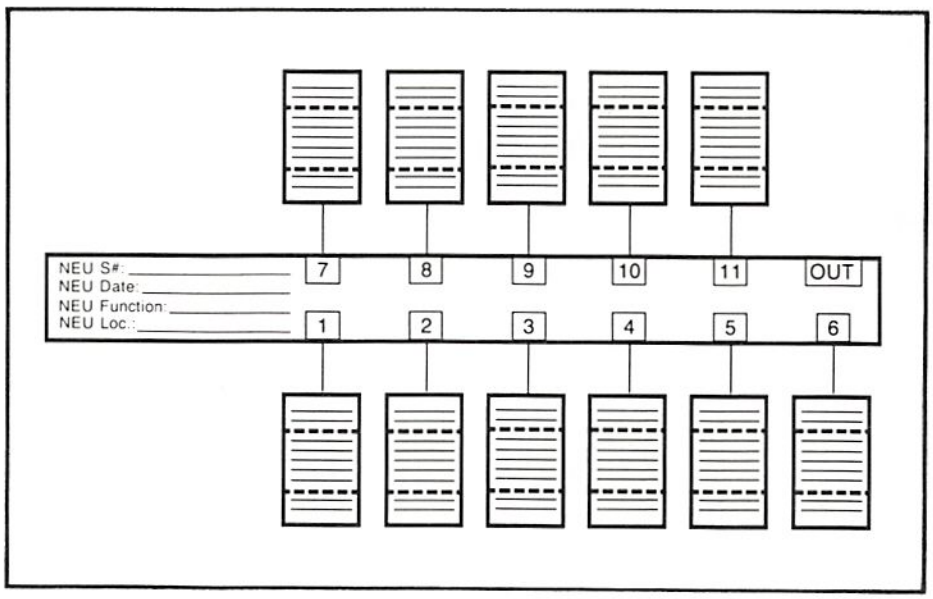


Figure 7c. Star Map. Make a map like this to record which PCs, Daisy Chains, or secondary NEUs are connected to each NEU in the Star. Where a Daisy Chain or secondary NEU is connected to a numbered IN jack, write on the appropriate Record Form a reference to the map for that Daisy Chain or NEU.



Selecting Parts for a Daisy Chain

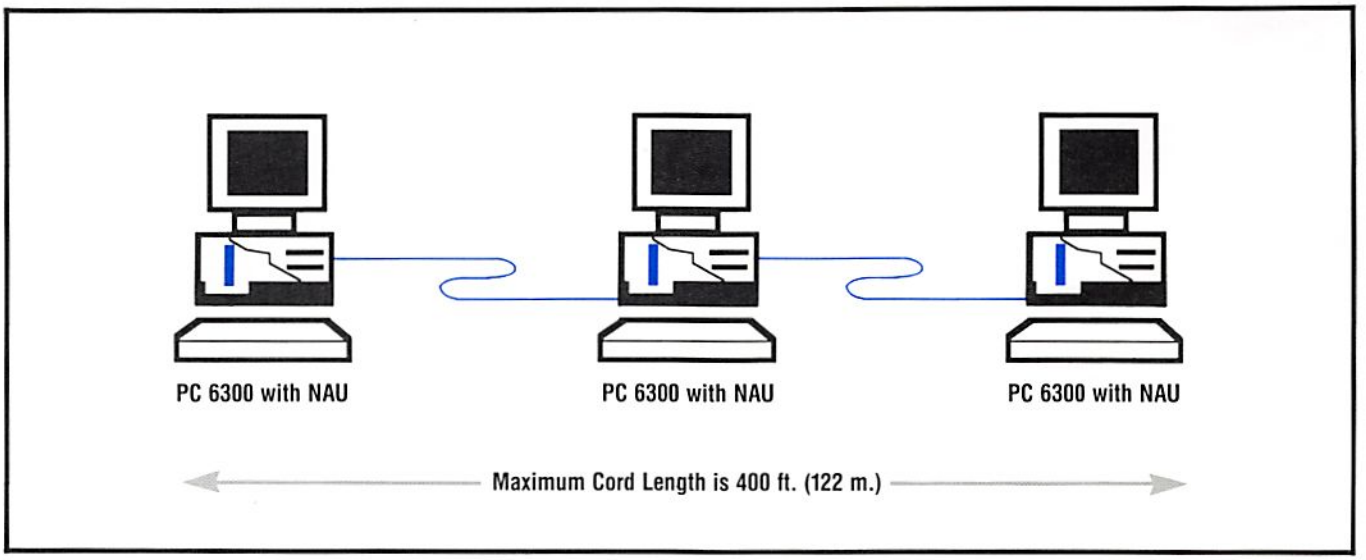


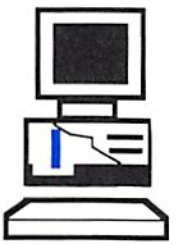
Figure 8. Daisy Chain Wiring Schematic

Selecting parts for a Daisy Chain is simply a matter of selecting the appropriate Network Access Units (NAUs), software, and cords. This procedure is described below. Complete the procedures described in the "Design Guidelines" section before selecting parts.

For ease of reference, each step below includes a drawing showing the appropriate part in blue. Use the worksheet at the end of the procedure to record the amount of each item you need, then take the completed worksheet to your AT&T Account Representative.

---

1. Select Network Access Units and Software.



Select the appropriate Network Access Unit (NAU) and software for each workstation and server.

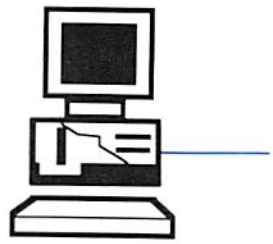
Network Access Unit Kits

- AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT
- AT&T UNIX PC Models 7300 and 3B1

Software

- AT&T PC 6300 Network Program
- AT&T UNIX PC Network Program

2. Select modular cords.



Check that the 10-foot modular DW8A-DE cord packaged with each NAU is adequate for the installation:

- If it's too short, select a longer cord and, if necessary, a 451A extension adapter. This adapter lets you connect two modular cords together.
- If plenum cord is required, select the appropriate length of DP8B-DE plenum-type cord and, if necessary, a 451A extension adapter.

Lengths of DW8A-DE Standard Modular Cord and DP8B-DE Plenum-type Cord

- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)
- 75 ft. (22.8 m.)
- 100 ft. (30.4 m.)
- 150 ft. (45.7 m.)
- 200 ft. (60.9 m.)

Ordering Worksheet for the Daisy Chain

Here is a list of all available parts for an AT&T STARLAN NETWORK Daisy Chain. As you design your configuration, note in the spaces provided the quantity of each part your network needs.

Reminder: Be sure each personal computer is equipped with the required memory and operating system to use the network.

Take the completed worksheet to your AT&T Account Representative.

Quantity You Will Need:

AT&T Network Access Unit Kits

AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT _____

AT&T UNIX PC Models 7300 and 3B1 _____

Software

AT&T PC 6300 Network Program _____

AT&T UNIX PC Network Program _____

Operating System

MS-DOS 3.1 _____

UNIX PC System Software Version 3.0 _____

Cords

DW8A-DE Standard Modular Cord		DP8B-DE Plenum-type Cord	
10 ft. (3.0 m.)	_____	10 ft. (3.0 m.)	_____
25 ft. (7.6 m.)	_____	25 ft. (7.6 m.)	_____
50 ft. (15.2 m.)	_____	50 ft. (15.2 m.)	_____
75 ft. (22.8 m.)	_____	75 ft. (22.8 m.)	_____
100 ft. (30.4 m.)	_____	100 ft. (30.4 m.)	_____
150 ft. (45.7 m.)	_____	150 ft. (45.7 m.)	_____
200 ft. (60.9 m.)	_____	200 ft. (60.9 m.)	_____

451A Cord Extension Adapter _____

Selecting Parts for a Room Star

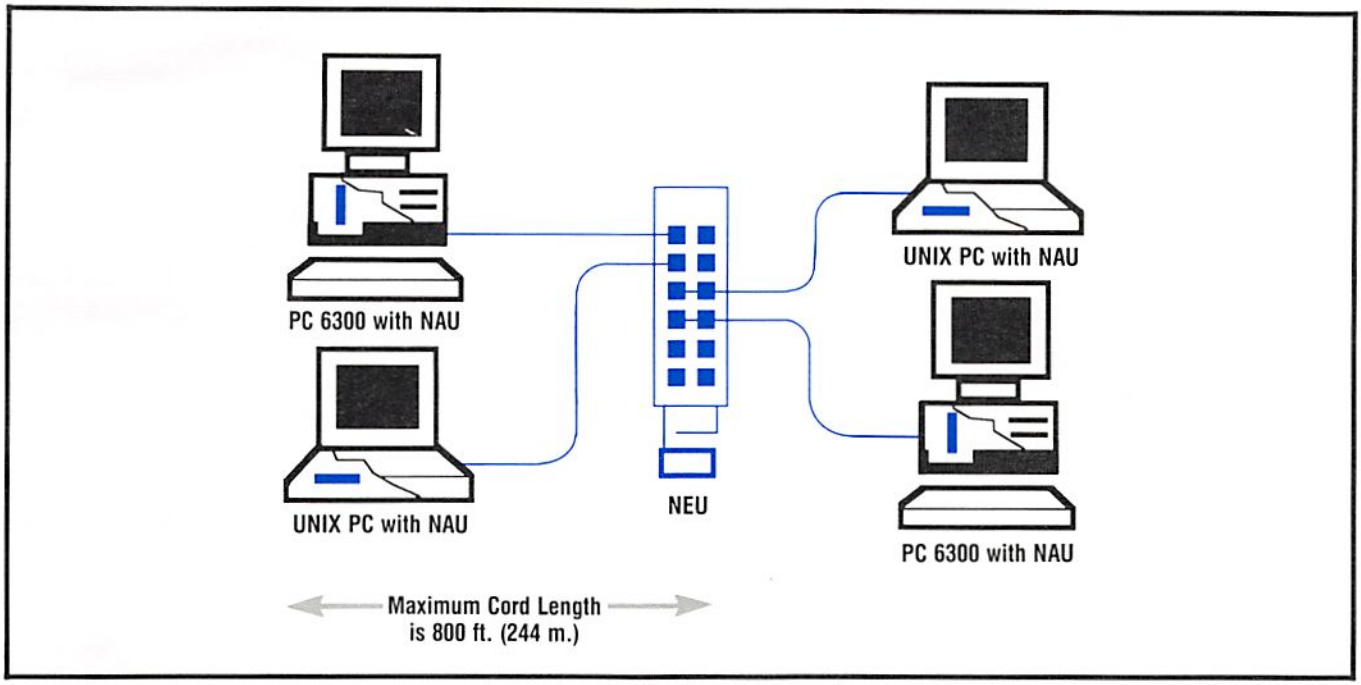


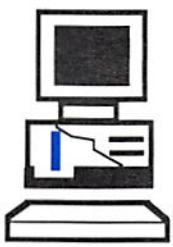
Figure 9. Room Star Wiring Schematic

Selecting parts for a Room Star is simply a matter of selecting the appropriate Network Access Units (NAUs), software, and cords, and the appropriate number of Network Extension Units (NEUs). This procedure is described below. Complete the procedures described in the "Design Guidelines" section before selecting parts.

For ease of reference, each step below includes a drawing showing the appropriate part in blue. Use the worksheet at the end of the procedure to record the amount of each item you need, then take the completed worksheet to your AT&T Account Representative.

---

1. Select Network Access Units and Software



Select the appropriate Network Access Unit (NAU) and software for each workstation and server.

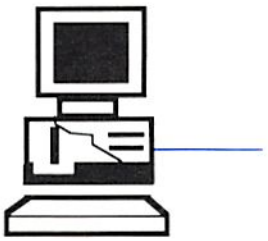
Network Access Unit Kits

- AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT
- AT&T UNIX PC Models 7300 and 3B1

Software

- AT&T PC 6300 Network Program
- AT&T UNIX PC Network Program

2. Select modular cords.



Check that the 10-foot modular DW8A-DE cord packaged with each NAU is adequate for the installation:

- If it's too short, select a longer cord and, if necessary, a 451A extension adapter. This adapter lets you connect two modular cords together.
- If plenum cord is required, select the appropriate length of DP8B-DE plenum-type cord and, if necessary, a 451A extension adapter.

Lengths of DW8A-DE Standard Modular Cord and DP8B-DE Plenum-type Cord

- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)
- 75 ft. (22.8 m.)
- 100 ft. (30.4 m.)
- 150 ft. (45.7 m.)
- 200 ft. (60.9 m.)

3. Select Network Extension Units and D8W cords.

Determine from the table the number of NEUs required.

- Locate the NEUs centrally in the room, within 10 feet of a power source not controlled by a switch.

Number of Direct Connections from PCs and Daisy Chains	Number of NEUs	Recommended Number of Spare IN Jacks*
1-10	1	1
11-19	2	2
20-29	3	2
30-39	4	2
40-49	5	2
50-58	6	3
59-68	7	3
69-77	8	4
78-87	9	4
88-97	10	4
98-107	11	4
108-117	12	4

* *The number of spare IN jacks is a recommendation. Be sure to leave enough spares to provide for the rearrangement or growth you anticipate for your network.*

Order a 2.5-foot (76 centimeter) D8W cord for each secondary NEU. If your network has only one NEU, you do not need this cord.

Ordering Worksheet for the Room Star

Here is a list of all available parts for an AT&T STARLAN NETWORK Room Star. As you design your configuration, note in the spaces provided the quantity of each part your network needs.

Reminder: Be sure each personal computer is equipped with the required memory and operating system to use the network.

Take the completed worksheet to your AT&T Account Representative.

Quantity You Will Need:

AT&T Network Access Unit Kits

AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT _____

AT&T UNIX PC Models 7300 and 3B1 _____

Software

AT&T PC 6300 Network Program _____

AT&T UNIX PC Network Program _____

Operating System

MS-DOS 3.1 _____

UNIX PC System Software Version 3.0 _____

AT&T Network Extension Unit Kit _____

Cords

DW8A-DE Standard Modular Cord

10 ft. (3.0 m.) _____
25 ft. (7.6 m.) _____
50 ft. (15.2 m.) _____
75 ft. (22.8 m.) _____
100 ft. (30.4 m.) _____
150 ft. (45.7 m.) _____
200 ft. (60.9 m.) _____

DP8B-DE Plenum-type Cord

10 ft. (3.0 m.) _____
25 ft. (7.6 m.) _____
50 ft. (15.2 m.) _____
75 ft. (22.8 m.) _____
100 ft. (30.4 m.) _____
150 ft. (45.7 m.) _____
200 ft. (60.9 m.) _____

D8W Modular Cord

2.5 ft. (76 cm.) _____

451A Cord Extension Adapter _____

Selecting Parts for a Closet Star

Each of the next three sections is a self-contained description of the design procedure for an AT&T wiring environment. The procedures assume familiarity with wiring hardware and terminology.

Each section begins with a schematic drawing showing how a workstation or server should be wired in that environment, from the user room to the hub. STARLAN NETWORK components, hardware, and cords are printed in blue. To make the procedures easy to use, each step includes a small drawing of the appropriate part. Each section ends with a worksheet for recording how many of each item to order.

The sections are these:

1. Premises Distribution System (PDS) environment, also known as 110-Type;
2. 66-Type;
3. 1A-Key System.

For complete installation procedures, see the *STARLAN NETWORK Installation and Maintenance Guide*.

A Closet Star can be installed in any AT&T wiring environment. But because hardware requirements and wiring connections are different for each of these environments, an AT&T Technical Consultant, System Technician, or Premises Services Consultant must inspect the installation site to identify its wiring environment. At each outlet, the wiring expert must select two unused pairs for the STARLAN NETWORK and, if required, a new adapter or connecting block to access those pairs, or new wiring if no pairs are available.

Premises Distribution System

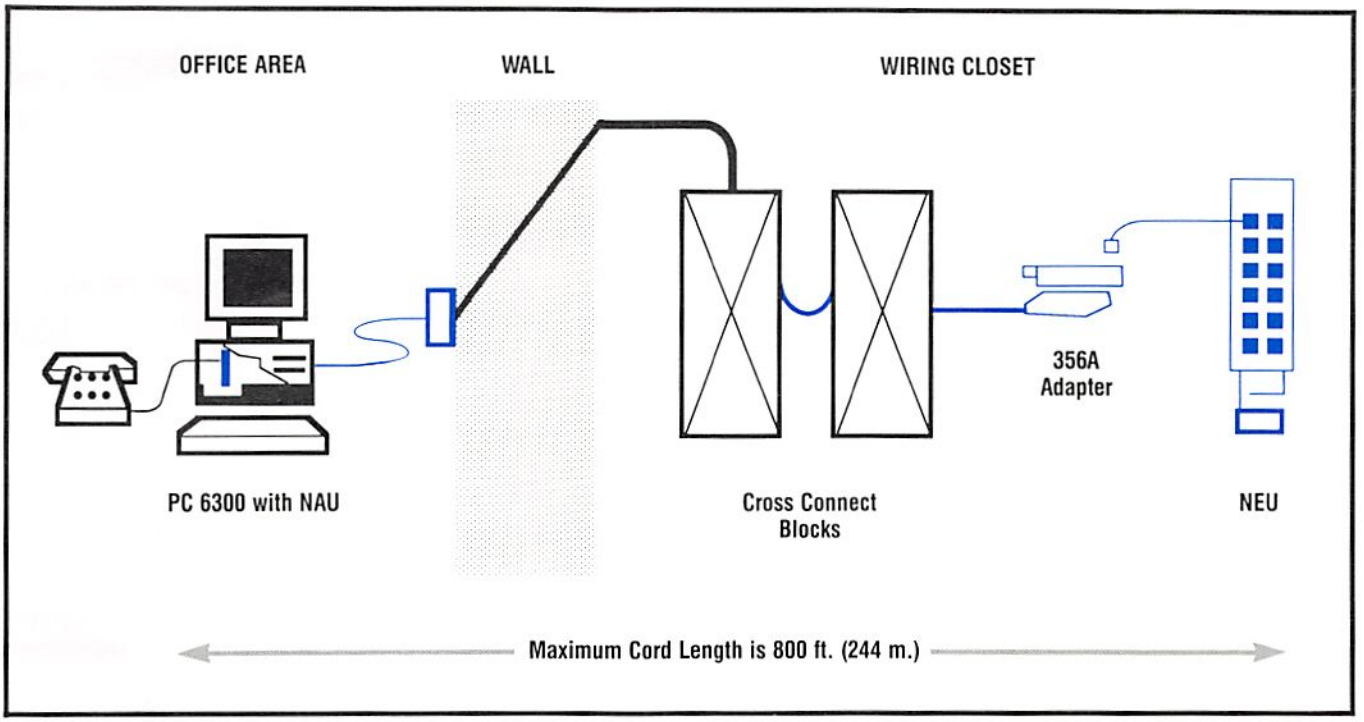


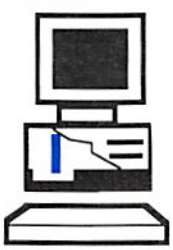
Figure 10. Premises Distribution System Wiring Schematic

Here is the procedure for selecting parts for a Closet Star in a Premises Distribution System environment. To make the procedure easy to use, each step below includes a drawing showing the appropriate part in blue. Complete the procedures described in the "Design Guidelines" section before selecting parts.

Use the worksheet at the end of this procedure to record the amount of each item you need, then take the completed worksheet to your AT&T Account Representative.

---

1. Select Network Access Units and Software.



Select the appropriate Network Access Unit (NAU) and software for each workstation and server.

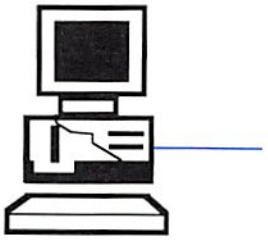
Network Access Unit Kits

- AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT
- AT&T UNIX PC Models 7300 and 3B1

Software

- AT&T PC 6300 Network Program
- AT&T UNIX PC Network Program

2. Select modular cords.



Check that the 10-foot modular DW8A-DE cord packaged with each NAU is adequate for the installation:

- If it's too short, select a longer cord and, if necessary, a 451A extension adapter. This adapter lets you connect two modular cords together.
- If plenum cord is required, select the appropriate length of DP8B-DE plenum-type cord and, if necessary, a 451A extension adapter.

Lengths of DW8A-DE Standard Modular Cord and DP8B-DE Plenum-type Cord

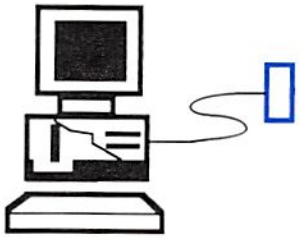
- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)
- 75 ft. (22.8 m.)
- 100 ft. (30.4 m.)
- 150 ft. (45.7 m.)
- 200 ft. (60.9 m.)

For a PC 6300 or compatible computer equipped with an AT&T Communications Manager card, select from the list below a short modular cord to connect the card to the NAU.

For a UNIX PC Model 7300 or Model 3B1, select a short modular cord to connect a LINE jack to the NAU.

- D2R: 7 in. (17 cm.)
- D4BU: 1 ft. (30 cm.)
- D6AM: 2 ft. (60 cm.)

3. **Select connecting blocks and station cable.**



A separate connecting block is required for the network connection except when an analog phone is connected to the existing wall outlet.

If a digital or hybrid phone is connected to the existing wall outlet, select a connecting block and four-pair station cable to install an additional outlet.

Because the digital or hybrid phone and the Closet Star use the same station cable pairs, an additional outlet must be installed to connect the workstation or server to the Closet Star. The DW8A-DE cord from the NAU plugs into the second outlet.

If an analog phone is connected to the outlet, an additional connecting block or adapter is not required. The DW8A-DE cord from the NAU replaces the analog phone at the existing outlet, and the phone is plugged into the PHONE jack of the NAU.

Connecting Blocks

- 103A (one eight-pin jack)
- 104A (two eight-pin jacks)

Four-pair Station Cable Rolls

- 300 ft. (91.4 m.)
- 500 ft. (152.4 m.)
- 1,000 ft. (304.8 m.)

4. Select Network Extension Units and D8W cords.

Determine from the table the number of Network Extension Units (NEUs) the hub requires.

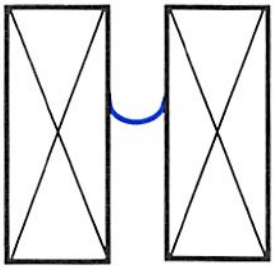
- Locate the NEUs within 10 feet of a power source not controlled by a switch.

Number of Direct Connections from PCs and Daisy Chains	Number of NEUs	Recommended Number of Spare IN Jacks*
1-10	1	1
11-19	2	2
20-29	3	2
30-39	4	2
40-49	5	2
50-58	6	3
59-68	7	3
69-77	8	4
78-87	9	4
88-97	10	4
98-107	11	4
108-117	12	4

* *The number of spare IN jacks is a recommendation. Be sure to leave enough spares to provide for the rearrangement or growth you anticipate for your network.*

Order a 2.5-foot (76 centimeter) D8W cord for each secondary NEU. If your network has only one NEU, you do not need this cord.

5. Select patch cords.

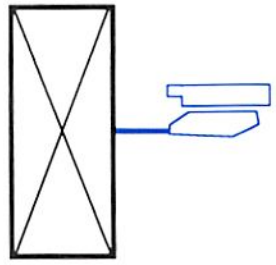


If an analog phone shares the station cable with the workstation or server, be sure that there's a two-pair patch cord to connect the wire pair appearances on the blue field to the purple field, and a one-pair patch cord to connect its appearances on the blue field to the white/gray field.

If there's no phone, be sure there's a three-pair patch cord to connect the workstation's or server's wire pair appearances on the blue field to the purple field.

The wiring closet should already be equipped with a complete set of patch cords, including unused patch cords for making these connections. Additional Premises Distribution System patch cord sets can be ordered through your AT&T Account Representative.

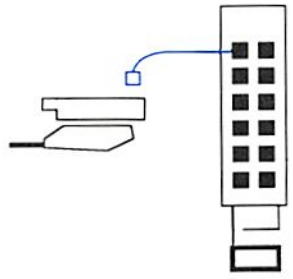
6. **Select 356A Adapters.**



Order two 356A Adapters for each NEU.

Each 356A Adapter is connected by a 25-pair cable to the appropriate wire pair appearances on the purple field. The adapter allows the workstation's or server's wire appearances on the field to be connected to the NEU. Because each adapter has eight jacks, an NEU requires two adapters to provide enough connections for its 11 jacks.

7. **Select D8W cords for the 356A Adapters.**



Order a 2.5-foot (76 centimeter) D8W cord to connect each workstation's or server's wire pair appearances from a 356A Adapter jack to an IN jack of an NEU.

Ordering Worksheet for the PDS Closet Star

Here is a list of all available parts for an AT&T STARLAN NETWORK Premises Distribution System Closet Star. As you design your configuration, note in the spaces provided the quantity of each part your network needs.

Reminder: Be sure each personal computer is equipped with the required memory and operating system to use the network.

Take the completed worksheet to your AT&T Account Representative.

Quantity You Will Need:

AT&T Network Access Unit Kits

AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT _____

AT&T UNIX PC Models 7300 and 3B1 _____

Software

AT&T PC 6300 Network Program _____

AT&T UNIX PC Network Program _____

Operating System

MS-DOS 3.1 _____

UNIX PC System Software Version 3.0 _____

AT&T Network Extension Unit Kit _____

Cords

DW8A-DE Standard Modular Cord		DP8B-DE Plenum-type Cord	
10 ft. (3.0 m.)	_____	10 ft. (3.0 m.)	_____
25 ft. (7.6 m.)	_____	25 ft. (7.6 m.)	_____
50 ft. (15.2 m.)	_____	50 ft. (15.2 m.)	_____
75 ft. (22.8 m.)	_____	75 ft. (22.8 m.)	_____
100 ft. (30.4 m.)	_____	100 ft. (30.4 m.)	_____
150 ft. (45.7 m.)	_____	150 ft. (45.7 m.)	_____
200 ft. (60.9 m.)	_____	200 ft. (60.9 m.)	_____

D8W Modular Cord
2.5 ft. (76 cm.) _____

D4BU Modular Cord
1 ft. (30 cm.) _____

D2R Modular Cord
7 inch (17 cm.) _____

D6AM Modular Cord
2 ft. (60 cm.) _____

451A Cord Extension Adapter _____

Connecting Blocks

103A Connecting Block _____

104A Connecting Block _____

356A Adapter _____

Four-pair Station Cable Rolls

300 ft. (91.4 m.) _____

500 ft. (152.4 m.) _____

1,000 ft. (304.8 m.) _____

66-Type

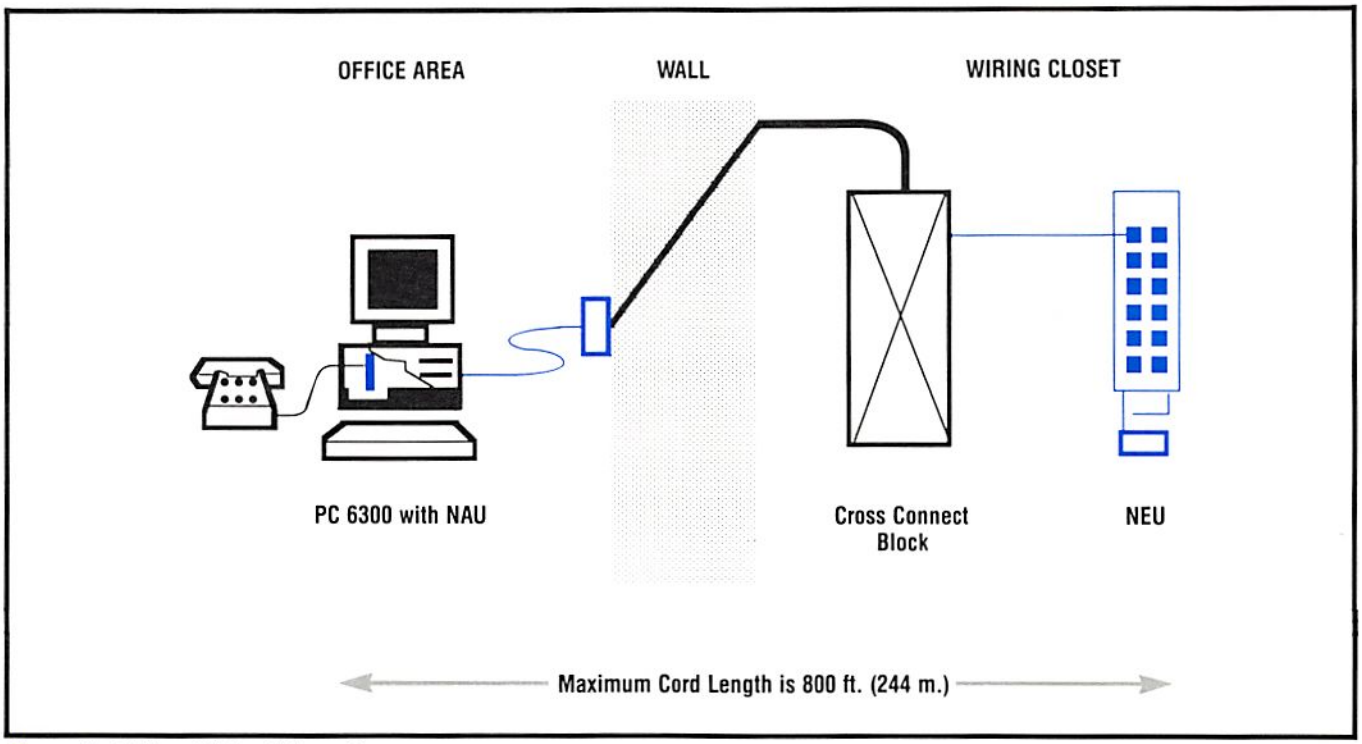
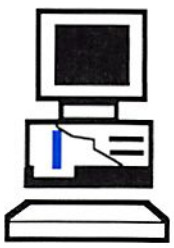


Figure 11. 66-Type Wiring Schematic

Here is the procedure for selecting parts for a Closet Star in a 66-Type wiring environment. To make the procedure easy to use, each step below includes a drawing showing the appropriate part in blue. Complete the procedures described in the "Design Guidelines" section before selecting parts.

Use the worksheet at the end of this procedure to record the amount of each item you need, then take the completed worksheet to your AT&T Account Representative.

1. **Select Network Access Units and Software**



Select the appropriate Network Access Unit (NAU) and software for each workstation and server.

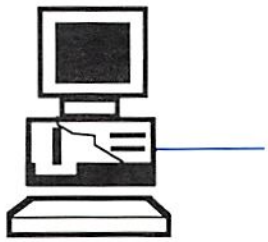
Network Access Unit Kits

- AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT
- AT&T UNIX PC Models 7300 and 3B1

Software

- AT&T PC 6300 Network Program
- AT&T UNIX PC Network Program

2. Select modular cords.



Check that the 10-foot modular DW8A-DE cord packaged with each NAU is adequate for the installation:

- If it's too short, select a longer cord and, if necessary, a 451A extension adapter. This adapter lets you connect two modular cords together.
- If plenum cord is required, select the appropriate length of DP8B-DE plenum-type cord from the table and, if necessary, a 451A extension adapter.

Lengths of DW8A-DE Standard Modular Cord and DP8B-DE Plenum-type Cord

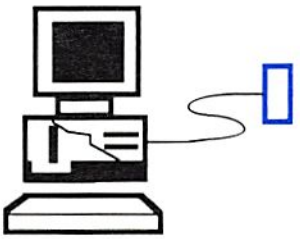
- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)
- 75 ft. (22.8 m.)
- 100 ft. (30.4 m.)
- 150 ft. (45.7 m.)
- 200 ft. (60.9 m.)

For a PC 6300 or compatible computer equipped with an AT&T Communications Manager card, select from the list below a short modular cord to connect the card to the NAU.

For a UNIX PC Model 7300 or Model 3B1, select a short modular cord to connect a LINE jack to the NAU.

- D2R: 7 in. (17 cm.)
- D4BU: 1 ft. (30 cm.)
- D6AM: 2 ft. (60 cm.)

3. **Select adapters for the wall outlets.**



Select an adapter for the wall outlet if:

- A digital or hybrid phone is connected to the outlet. Select a 258A or 258AF adapter. The additional jacks included in each adapter are necessary to access the pairs used by the digital phone and the STARLAN NETWORK.
- An analog phone is connected to the outlet, but you want to use an unused four-pair group (that is, two pairs for the analog phone and two pairs for the STARLAN NETWORK) different from those already leading to the phone. Use the table to select the adapter that accesses the four-pair group you want.

To Access these GROUPS and PAIRS:		Select this Adapter: MALE	FEMALE
all	all	258A	258AF
1	1-4	259A	259AF
2	5-8	259B	259BF

An adapter is unnecessary if an analog phone is connected to the wall outlet and you decide to use the group of unused pairs already leading to the phone. In this case, simply use the existing wall outlet.

4. Select Network Extension Units and D8W cords.

Determine from the table the number of Network Extension Units (NEUs) the hub requires.

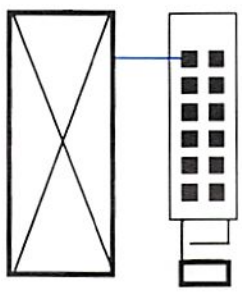
- Locate the NEUs within 10 feet of a power source not controlled by a switch.

Number of Direct Connections from PCs and Daisy Chains	Number of NEUs	Recommended Number of Spare IN Jacks*
1-10	1	1
11-19	2	2
20-29	3	2
30-39	4	2
40-49	5	2
50-58	6	3
59-68	7	3
69-77	8	4
78-87	9	4
88-97	10	4
98-107	11	4
108-117	12	4

* *The number of spare IN jacks is a recommendation. Be sure to leave enough spares to provide for the rearrangement or growth you anticipate for your network.*

Order a 2.5-foot (76 centimeter) D8W cord for each secondary NEU. If your network has only one NEU, you do not need this cord.

5. Select DW8A-SE cords.



Select the shortest DW8A-SE cord adequate to connect the wire pairs for each workstation or server from their appearances on the cross connect block to an NEU jack. The recommended maximum cord length for this connection is 25 feet (7.6 meters).

DW8A-SE Modular Cord

- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)

Ordering Worksheet for the 66-Type Closet Star

Here is a list of all available parts for an AT&T STARLAN 66-type Closet Star. As you design your configuration, note in the spaces provided the quantity of each part your network needs.

Reminder: Be sure each personal computer is equipped with the required memory and operating system to use the network.

Take the completed worksheet to your AT&T Account Representative.

Quantity You Will Need:

AT&T Network Access Unit Kits

AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT _____

AT&T UNIX PC Models 7300 and 3B1 _____

Software

AT&T PC 6300 Network Program _____

AT&T UNIX PC Network Program _____

Operating System

MS-DOS 3.1 _____

UNIX PC System Software Version 3.0 _____

AT&T Network Extension Unit Kit _____

Cords

DW8A-DE Standard Modular Cord		DP8B-DE Plenum-type Cord	
10 ft. (3.0 m.)	_____	10 ft. (3.0 m.)	_____
25 ft. (7.6 m.)	_____	25 ft. (7.6 m.)	_____
50 ft. (15.2 m.)	_____	50 ft. (15.2 m.)	_____
75 ft. (22.8 m.)	_____	75 ft. (22.8 m.)	_____
100 ft. (30.4 m.)	_____	100 ft. (30.4 m.)	_____
150 ft. (45.7 m.)	_____	150 ft. (45.7 m.)	_____
200 ft. (60.9 m.)	_____	200 ft. (60.9 m.)	_____

D8WA-SE Modular Cord

10 ft. (3.0 m.) _____

25 ft. (7.6 m.) _____

50 ft. (15.2 m.) _____

D8W Modular Cord

2.5 ft. (76 cm.) _____

D2R Modular Cord

7 in. (17 cm.) _____

D4BU Modular Cord

1 ft. (30 cm.) _____

D6AM Modular Cord

2 ft. (60 cm.) _____

451A Cord Extension Adapter _____

Adapters

258A	_____	259B	_____
258AF	_____	259AF	_____
259A	_____	259BF	_____

1A-Key System

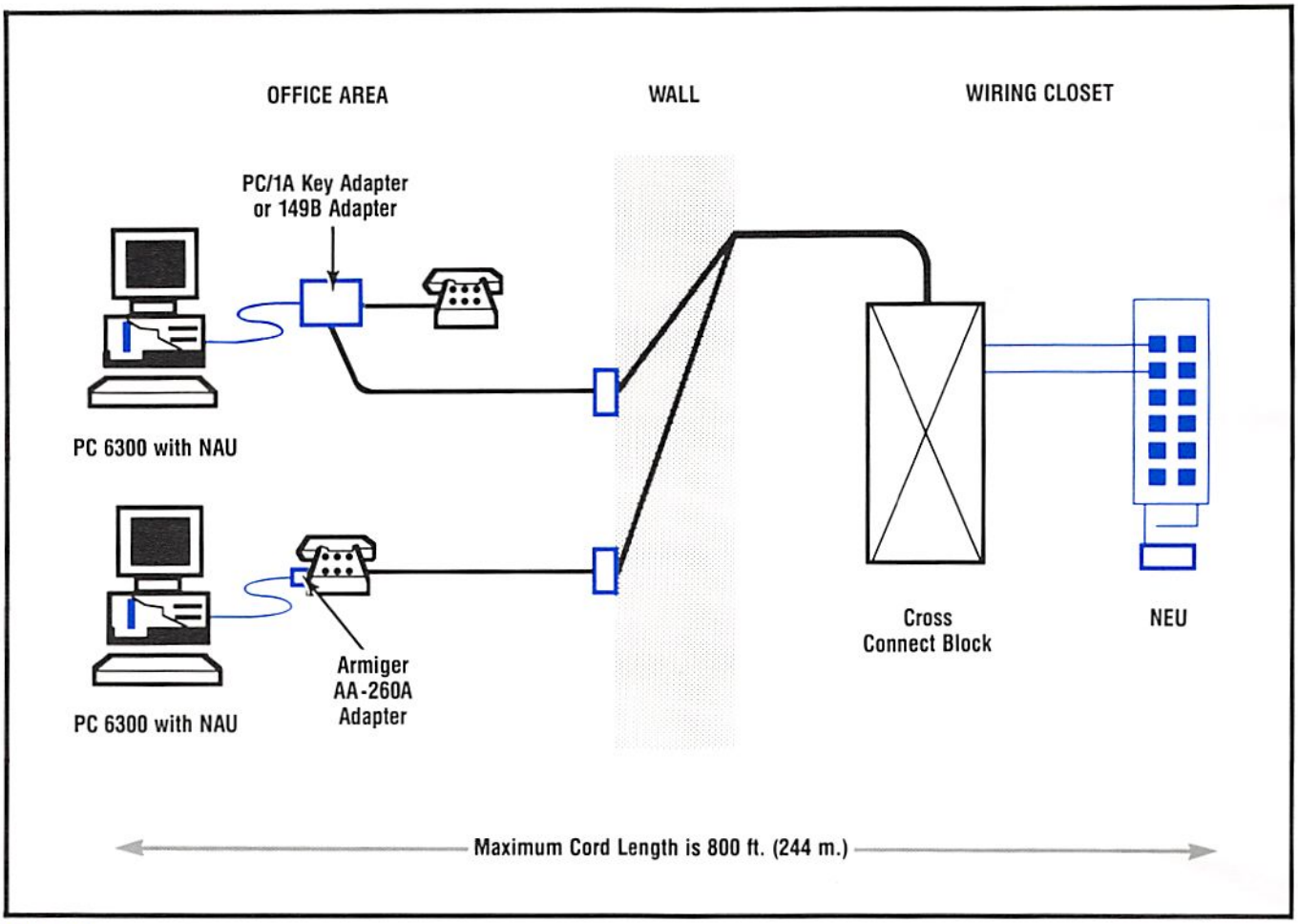


Figure 12. 1A-Key System Wiring Schematic

Here is the procedure for selecting parts for a Closet Star in a 1A-Key System wiring environment. To make the procedure easy to use, each step below includes a drawing showing the appropriate part in blue. Complete the procedures described in the "Design Guidelines" section before selecting parts.

Use the worksheet at the end of this procedure to record the amount of each item you need, then take the completed worksheet to your AT&T Account Representative.

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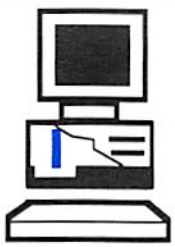
1. Select Network Access Units and Software



Select the appropriate Network Access Unit (NAU) and software for each workstation and server.

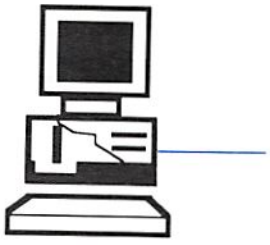
Network Access Unit Kits

- AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT
- AT&T UNIX PC Models 7300 and 3B1

Software

- AT&T PC 6300 Network Program
- AT&T UNIX PC Network Program

2. Select modular cords.



Check that the 10-foot modular DW8A-DE cord packaged with each NAU is adequate for the installation:

- If it's too short, select a longer cord and, if necessary, a 451A extension adapter. This adapter lets you connect two modular cords together.
- If plenum cord is required, select the appropriate length of DP8B-DE plenum-type cord and, if necessary, a 451A extension adapter.
- If the unused pairs that appear at the phone will be accessed by a 149B Adapter, or directly by a D8AB cord, select a seven-foot D8AB cord for use in place of the DW8A-DE cord. See the next step for the recommended access methods.

Lengths of DW8A-DE Standard Modular Cord and DP8B-DE Plenum-type Cord

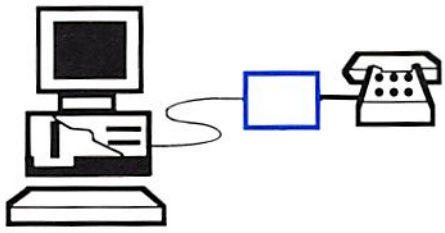
- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)
- 75 ft. (22.8 m.)
- 100 ft. (30.4 m.)
- 150 ft. (45.7 m.)
- 200 ft. (60.9 m.)

For a PC 6300 or compatible computer equipped with an AT&T Communications Manager card, select from the list below a short modular cord to connect the card to the NAU.

For a UNIX PC Model 7300 or Model 3B1, select a short modular cord to connect a LINE jack to the NAU.

- D2R: 7 in. (17 cm.)
- D4BU: 1 ft. (30 cm.)
- D6AM: 2 ft. (60 cm.)

3. **Select adapters for the unused pairs.**



If the phone is a 6-Button or Call Director Key set, select an adapter to access the unused pairs:

- The recommended adapter is the PC/1A Key Adapter. If this is unavailable, use the less expensive 149B Adapter, or, as a final choice, the Armiger AA-260A Adapter. A seven-foot D8AB cord may be connected directly to the unused pairs at the phone, but an adapter is preferable.
- The recommended unused pairs to access are 16/41 and 17/42. If these are unavailable, access pairs 21/46 and 22/47. And if these are unavailable, access any two of the speakerphone pairs 23/48, 24/49, or 25/50.

Adapters

—PC/1A Key Adapter

—49B Adapter

—Armiger AA260A Modular Adapter

- If the phone is a 10- or 20-Button Key Set, it lacks unused pairs. In this case, you have two options:
  - —Use any modular outlet in the room with unused pairs
  - —Install a new outlet, and run four-pair station cable from it to the wiring closet.

Four-pair Station Cable Rolls

- 300 ft. (91.4 m.)
- 500 ft. (152.4 m.)
- 1,000 ft. (304.8 m.)

4. Select Network Extension Units and D8W cords.

Determine from the table the number of Network Extension Units (NEUs) the hub requires.

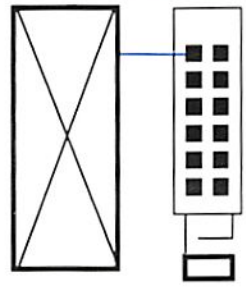
- Locate the NEUs within 10 feet of a power source not controlled by a switch.

Number of Direct Connections from PCs and Daisy Chains	Number of NEUs	Recommended Number of Spare IN Jacks*
1-10	1	1
11-19	2	2
20-29	3	2
30-39	4	2
40-49	5	2
50-58	6	3
59-68	7	3
69-77	8	4
78-87	9	4
88-97	10	4
98-107	11	4
108-117	12	4

* *The number of spare IN jacks is a recommendation. Be sure to leave enough spares to provide for the rearrangement or growth you anticipate for your network.*

Order a 2.5-foot (76 centimeter) D8W cord for each secondary NEU. If your network has only one NEU, you do not need this cord.

5. Select DW8A-SE cords.



Select the shortest DW8A-SE cord adequate to connect the wire pairs for each workstation or server from their appearances on the cross connect block to an NEU jack. The recommended maximum cord length for this connection is 25 feet (7.6 meters).

DW8A-SE Modular Cord

- 10 ft. (3.0 m.)
- 25 ft. (7.6 m.)
- 50 ft. (15.2 m.)

Ordering Worksheet for the 1A-Key System Closet Star

Here is a list of all available parts for an AT&T STARLAN NETWORK 1A-Key System Closet Star. As you design your configuration, note in the spaces provided the quantity of each part your network needs.

Reminder: Be sure each personal computer is equipped with the required memory and operating system to use the network.

Take the completed worksheet to your AT&T Account Representative.

Quantity You Will Need:

AT&T Network Access Unit Kits

AT&T PC 6300, AT&T PC 6300 PLUS, IBM PC, PC-XT, and PC-AT _____

AT&T UNIX PC Models 7300 and 3B1 _____

Software

AT&T PC 6300 Network Program _____

AT&T UNIX PC Network Program _____

Operating System

MS-DOS 3.1 _____

UNIX PC System Software Version 3.0 _____

AT&T Network Extension Unit Kit _____

Cords

DW8A-DE Standard Modular Cord		DP8B-DE Plenum-type Cord	
10 ft. (3.0 m.)	_____	10 ft. (3.0 m.)	_____
25 ft. (7.6 m.)	_____	25 ft. (7.6 m.)	_____
50 ft. (15.2 m.)	_____	50 ft. (15.2 m.)	_____
75 ft. (22.8 m.)	_____	75 ft. (22.8 m.)	_____
100 ft. (30.4 m.)	_____	100 ft. (30.4 m.)	_____
150 ft. (45.7 m.)	_____	150 ft. (45.7 m.)	_____
200 ft. (60.9 m.)	_____	200 ft. (60.9 m.)	_____

D8AB Modular Cord
7 ft. (2.1 m.) _____

DW8A-SE Modular Cords
10 ft. (3.0 m.) _____
25 ft. (7.6 m.) _____
50 ft. (15.2 m.) _____

D8W Modular Cord
2.5 ft. (76 cm.) _____

D2R Modular Cord
7 in. (17 cm.) _____

D4BU Modular Cord
1 ft. (30 cm.) _____

D6AM Modular Cord
2 ft. (60 cm.) _____

Adapters

PC/1A Key Adapter _____
149B Adapter _____
Armiger AA-206A Adapter _____

Four-pair Station Cable Rolls

300 ft. (91.4 m.) _____
500 ft. (152.4 m.) _____
1,000 ft. (304.8 m.) _____

USEFUL TERMS

This section explains technical terms for readers unfamiliar with communications wiring and local area networks.

Adapter
A device that enables different sizes or types of plugs to connect to one another, providing for the rearrangement of wires.

Analog phone
A phone that uses a continuously varying electrical signal to transmit and receive voice. It generally requires a single pair of wires. An example is the standard home phone.

Appearance
The electrical contacts from a phone, workstation, or other communications device. Examples are the wire leads coming from a device, or the contacts on a cross connect block or modular jack to which a device is wired.

AT&T Network Access Unit (NAU)
A plug-in expansion card that enables AT&T STARLAN NETWORK workstations and servers to send and receive data through the network.

AT&T Network Extension Unit (NEU)
A wall-mounted device that increases the number of workstations and servers connected in an AT&T STARLAN NETWORK, and extends the distances between them. It contains 12 modular jacks: 11 IN jacks for connections from devices, and 1 OUT jack for connecting the NEU to a Master NEU.

Closet Star
An AT&T STARLAN NETWORK configuration in which workstations and servers are electrically connected through a wiring closet. The workstations and servers are plugged into modular wall outlets, where they access unused pairs in the phone wiring. These pairs, in turn, are connected to a Network Extension Unit in the wiring closet.

Configuration
The layout of phones, workstations, and other communications devices in a communications system.

Connecting block
See Modular jack.

Cross connect
A panel (also called a "field or "wiring block") on which the leads of station cable are mounted so that an AT&T Systems Technician, other wiring craftsperson, or the system administrator can make electrical connections between the communications devices wired to the cables.

Daisy Chain
An AT&T STARLAN NETWORK configuration in which workstations and servers are connected with modular cords.

Digital phone
A phone that uses a discontinuous signal to provide voice communications and other features.

Hub
The AT&T Network Extension Unit (NEU) or group of NEUs to which workstations and servers are wired.

Hybrid phone
A phone that uses a digital signal to provide data communications and other features, in addition to using an analog signal for voice communications. It generally requires from two to four pairs of wires: one pair for the analog voice signal, and the remaining pairs for the digital signals.

Master Network Extension Unit (NEU)
A Network Extension Unit to which other NEUs in the same hub are connected. The OUT jack of each secondary NEU is linked by a modular cord to an IN jack of the Master NEU.

Modular cord
A cord containing four pairs of wires, with a modular plug on one or both ends.

Modular jack
Also called "connecting block," "modular wall outlet," or "information outlet." A receptacle used with a modular plug to make electrical contact between circuits and communications devices such as phones and workstations.

Modular wall outlet
See Modular jack.

Network hub
See Hub.

1A-Key system
The AT&T wiring system for the 6-button phones called 1A-Key sets.

Patch cord
A short length of wire with connectors on each end used at cross connects. It completes a circuit by connecting incoming wire pairs on one cross connect to outgoing wire pairs on another.

Plenum cord
Phone cord with fire-retardant insulation, generally used in suspended ceilings and other places where air circulates back to the building's air-conditioning system.

Premises Distribution System
Also called "110-Type" wiring environment. The AT&T wiring system in which phones, workstations, and other communications devices can be easily added and rearranged with modular wiring components and patch cords.

Printer sharing
An AT&T STARLAN NETWORK server's ability to allow many STARLAN NETWORK workstations to share a single printer.

Room Star
An AT&T STARLAN NETWORK configuration in which workstations and servers in a single room are connected to a Network Extension Unit.

Secondary Network Extension Unit (NEU)
In an AT&T STARLAN NETWORK hub, a Network Extension Unit whose OUT jack is connected by a modular cord to the IN jack of the Master NEU.

Server
A computer that provides files and printers for use by network workstations.

66-Type wiring environment
The older AT&T wiring system, now being replaced by the 110-Type, in which a special tool must be used to attach to the cross connect the twisted pairs from phones, workstations, and other communications devices.

Station cable
The cable connecting phones, workstations, and other communications devices from a user location—the "station"—to the wiring closet.

Twisted pairs
Pairs of insulated copper wires twisted around each other. The type of wire used in AT&T wiring environments.

Unused pair
A pair of unused wires in a station cable.

Wiring closet
A room, closet, or cabinet where station cable is terminated on cross connect blocks and where the building communications system can be administered.

Wiring environment
Any building communications wiring system.

Workstation
In the STARLAN NETWORK, a personal computer running personal applications and sharing network files and printers through a server.

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AT&T STARLAN NETWORK at a Glance

Compatible Operating Systems

MS-DOS 3.1 or later
UNIX PC System Software Version 3 or later

Software Services

AT&T PC 6300 Network Program
AT&T UNIX PC Network Program

Personal Computers

AT&T PC 6300 and AT&T PC 6300 PLUS
IBM PC, PC-XT, PC-AT, and other AT&T PC 6300 compatible computers
AT&T UNIX PC Models 7300 and 3B1

Components

Network Access Units
Network Extension Unit

Transmission Media

Modular phone cords
Building phone wiring (two unshielded twisted pairs dedicated to the STARLAN NETWORK)

Configurations

Daisy Chain
Room Star
Closet Star

Maximum Number of Personal Computers

Daisy Chain: 10
Star Configurations: 200, depending on software applications

Maximum Media Lengths

Daisy Chain: 400 feet (122 meters) total
Room Star: 800 feet (244 meters) from workstation or server to the Network Extension Unit
Closet Star: 800 feet (244 meters) from workstation or server to the Network Extension Unit

Transmission Speed

1 megabit per second

Access Method

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

Network Standard

Compatible with the IEEE 802.3 draft standard

999-809-101 IS